

Jameco Part number 143811

MINI-MODS

Miniature Engineering Modules

RAMPack B

Photo Not Yet Available

PRELIMINARY

Description

The RAMPack B module maintains 8Kx8 bytes of RAM. The module makes use of buffers and an on board microcontroller in order to allow addressable access to the RAM using only two i/o lines.

An automatic baud rate detection scheme allows the user to use a variety of baud rates without setting hardware jumpers. The RAMPack B supports 1200, 2400, 4800, 9600, and 19200 baud rates.

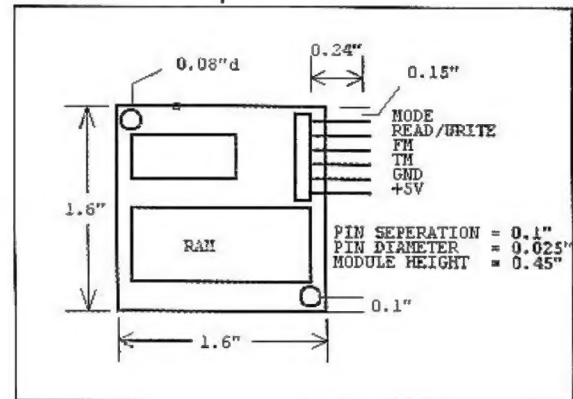
The 8Kx8 bytes of low cost static RAM comes socketed. If the user requires non-volatile RAM(RAM whose data stays valid after power is removed), a higher priced NVRAM can be purchased and inserted into the socket. A software command allows the RAMPack B to be expanded to handle 32Kx8 RAM.

An additional buffer mode has been implemented in the RAMPack B. It is a FIFO(first-in-first-out) buffer. Bytes of data may be sent to the device and each byte will be stored sequentially in RAM. Initiating a read in FIFO mode will cause the RAMPack B to send all of the stored data to the Master device. No commands or addressing are required to store data with FIFO mode. This mode does require a 4 pin interface to access it's functions.

Pin Descriptions

MODE	Has weak pull up resistor(100k ohm). Set or unconnected for normal operation. Pulled low for FIFO mode.
READ/WRITE	Has weak pull up resistor(100k ohm). Only used in FIFO mode. Set for a buffer READ. Clear for buffer WRITE.
FM	Data received from Master on this pin.
TM	Data sent to master on this pin.
GND	Ground potential, grounds are common.
+5V	Supply for control circuitry.

Mechanical Specifications



Operational Ratings

Operating Temperature:	0°C to 70°C
Storage Temperature:	-45°C to 85°C
Minimum Operational Voltage:	5.0V.
Maximum Operational Voltage:	7.0V
Voltage on Any Header Pin:	-0.3V to 7.0V
Maximum Current Sunk by TM/FM pin:	25mA
Maximum Current Sourced TM pin:	5mA
Average DC operational current:	10mA
Data Rates:	1.2, 2.4, 4.8, 9.6, 19.2 kbaud
Sync Byte:	hex55, binary"0101 0101"
Write Command:	hex00, binary"0000 0000"
Byte Read Command:	hex01, binary"0000 0001"
Block Read Command:	hex02, binary"0000 0010"
Expand RAM	hex03, binary"0000 0011"
FIFO Baud	hex04, binary"0000 0100"
Address Range:	hex0000-hex1FFF - normal hex0000-hex7FFF - expanded



SOLUTIONS CUBED

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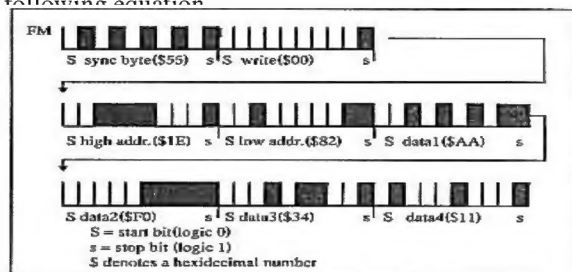
Communication Protocols

NOTE- When not in FIFO mode keep the MODE pin high or not connected. Weak pull up resistors are included on the MODE and READ/WRITE pins. The MODE and READ/WRITE pins are only used in FIFO mode.

WRITE-

The following timing diagram details the method for writing four bytes (data 1-data 4) to RAM, starting at address hex1E82. You must send a start bit followed by the 8 data bits and a stop bit for each byte. Data is sent to the RAMPack B on the FM pin (From Master). The RAMPack B will determine the baud rate to use from the sync byte (unless in buffer mode). The first byte sent is the sync byte (hex55); which is followed by the write command (hex00). The next two bytes are the high and low address bytes. This address is hex1E82, see the memory map for available locations. Make sure that you address only locations that actually exist (don't write to hex7FFF). After the address bytes are sent, the data bytes follow. Data1 will be written to location hex1E82. Data2 will be written to hex1E83, data3 to hex1E84, and data4 to hex1E85.

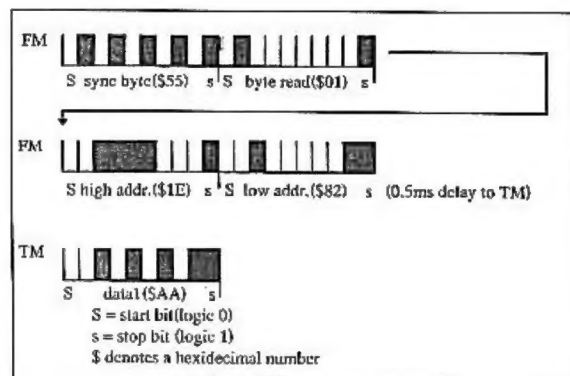
A WRITE command ends when the FM line has been high for a time period greater than 5 byte lengths. This can be easily done with a delay loop or pause routine. To calculate this delay use the following equation:



data format for WRITE (on FM pin)

command (hex01). The next two bytes are the high and low address bytes. This address is hex1E83. After the address bytes are received by the RAMPack waits for about 0.5ms. When this period elapses the data byte will be sent LSB first on

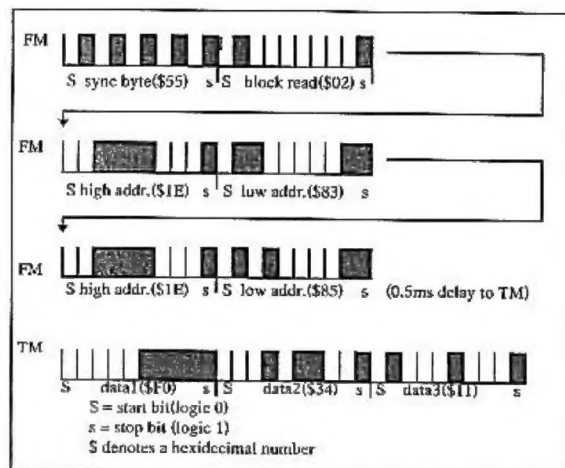
the TM (To Master) pin. Data will be read from location hex1E82.



Data format for BYTE READ

BLOCK READ-

The following timing diagram details the method for reading three bytes from RAM, starting at address hex1E83. The sync through address bytes are sent on the FM pin. The first byte sent is the sync byte (hex55); which is followed by the read command (hex02). The next two bytes are the high and low address bytes that the block read will start at. This address is hex1E83. The next two bytes are the address bytes that point to the end of the block read, or hex1E85. After the address bytes are received the RAMPack waits for about 0.5ms. When this period elapses the data bytes will be sent LSB first on the TM (To Master) pin. Data1 will be read from location hex1E83, data2 will be read from hex1E84, and data3 from hex1E85. Data sent on the TM pin is sent 8N1, as described above. The baud rate of data on the TM pin is the same as the rate of data on the FM pin when the read command was received.



Data format for BLOCK READ

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This routine uses the "write" and "block read" commands to write data to RAM. The lower byte address of the write and read is randomized with every pass. The sync byte is used to determine the baud rate of communication.

INPUT	15	
OUTPUT	14	
OUTPUT	13	
OUTPUT	12	
VALUE	VAR	BYTE

Initial values of variable registers

VALUE	= \$00
b4	= \$32
b5	= \$00
b15	= \$0A

START:

HIGH	14	set FM pin
HIGH	13	set read/write pin
HIGH	12	set mode pin to normal mode
PAUSE	3000	

MORE STUFF:

```
B6 = b4 + 8
WRITE (H'00') data at 9600 baud starting at H'10XX'
SEROUT 14,84,[$55,$00,$10,b4,VALUE,$01,$02,$03,$04,$05,$06,$07,VALUE]

PAUSE 2
Send BLOCK READ command. Read data from B4 to B4+8
or 9 bytes of data
SEROUT 14,84,[$55,$02,$10,b4,$10,b6]
read and store data
SERIN 15,84,100,NOISE2, [b15,b14,b13,b12,b11,b10,b9,b8,b7]
```

DISPLAY:

		display data
DEBUG	ISHEX2	b15,CR
DEBUG	ISHEX2	b14,TAB
DEBUG	ISHEX2	b13,TAB
DEBUG	ISHEX2	b12,TAB
DEBUG	ISHEX2	b11,CR
DEBUG	ISHEX2	b10,TAB
DEBUG	ISHEX2	b9,TAB
DEBUG	ISHEX2	b8,TAB
DEBUG	ISHEX2	b7,CR,CR

test if data written = data read

```
if VALUE <> b15 then NOISE
if b14 <> $01 then NOISE
if b13 <> $02 then NOISE
if b12 <> $03 then NOISE
if b11 <> $04 then NOISE
if b10 <> $05 then NOISE
if b9 <> $06 then NOISE
if b8 <> $07 then NOISE
if VALUE <> b7 then NOISE
VALUE = VALUE +1
```

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MIX_IT:

RANDOM W2

randomize lower byte of address

IF b4 > \$F7 THEN MIX_IT

GOTO MORE_STUFF

NOISE:

DEBUG BELL

DEBUG ISHEX2 b4,TAB

DEBUG ISHEX2 b6,TAB

DEBUG ISHEX2 VALUE,CR

GOTO DONE

NOISE2:

DEBUG BELL

DEBUG BELL

DONE:

END:

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This routine writes a byte of data to a random address in RAM at 1200 baud. If the byte written is equal to the byte read back from the same address then the address and data are displayed. If data is not correct then the bell is sounded.

INPUT	15	
OUTPUT	14	
OUTPUT	13	
OUTPUT	12	
VALUE	VAR	BYTE

Initial values of variable registers

VALUE	= \$AA
B4	= \$EF
B5	= \$10
B15	= \$00

START:

HIGH	14
HIGH	13
HIGH	12
PAUSE	3000

MORE_STUFF:

SEROUT	14, 813, [\$55, \$00, b5, b4, VALUE]
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PAUSE	50
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SEROUT	14, 813, [\$55, \$01, b5, b4]
SERIN	15, 813, 1000, NOISE2, [b15]

DISPLAY:

```
    DEBUG ISHEX2 b5, TAB
    DEBUG ISHEX2 b4, TAB
    DEBUG ISHEX2 VALUE, CR, CR
    if VALUE <> b15 then NOISE
    VALUE = VALUE +1
```

MIX_IT:

```
    RANDOM W2
    IF b5 > $1F THEN MIX_IT
    GOTO MORE_STUFF
```

NOISE:

```
    DEBUG BELL
```

NOISE2:

```
    DEBUG BELL
```

END:

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This routine makes use of the RAMPack B FIFO (first in first out) buffer. In buffer mode the RAMPack B stores data as it receives it. It also keeps track of the current address being written to. When a "read" is requested the RAMPack will send the user all data that has been been written to the RAM. In this routine the Basic STAMP 2 sends 9 bytes of data to the RAM buffer. It then reads back the data and checks to see if the data written matches the data read. The buffer mode does not use the sync byte to determine baud rates. The default baud rate is 2400 baud. If the buffer mode is going to be used the user should initialize the baud rate whenever power is applied to the RAMPack

INPUT	15	
OUTPUT	14	
OUTPUT	13	
OUTPUT	12	
VALUE	VAR	BYTE

Initial values of variable registers

VALUE	= \$DD
b4	= \$00
b5	= \$00
b15	= \$0A

START:

HIGH	14	FM pin
HIGH	13	read/write pin (low for write)
HIGH	12	mode pin (low for buffer mode)
PAUSE	3000	
		initialize buffer for 19200 baud communication
SEROUT	14, 32, [\$55,\$04]	
PAUSE	100	

MORE STUFF:

LOW	13	enter "write" mode
LOW	12	enter "buffer" mode
		send 9 bytes of data; 1 byte each 50ms
SEROUT	14, 32, 50,	[VALUE, \$55, \$99, \$88, \$32, \$57, \$69, \$00, \$10]
HIGH	12	exit "buffer" mode
PAUSE	2	
HIGH	13	enter "read" mode
LOW	12	enter "buffer" mode
		read in 9 bytes of data
SERIN	15, 32, 100	NOISE, [b15, b14, b13, b12, b11, b10, b9, b8, b7]
		exit "buffer" mode
HIGH	12	

DISPLAY:

DEBUG ISHEX2 b4, TAB, CR, CR

```
if VALUE <> b15 then NOISE
if b14 <> $55 then NOISE
if b13 <> $99 then NOISE
if b12 <> $88 then NOISE
if b11 <> $32 then NOISE
if b10 <> $57 then NOISE
if b9 <> $69 then NOISE
if b8 <> $00 then NOISE
if b7 <> $10 then NOISE
```

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VALUE = VALUE +1

MIX_IT:

RANDOM W2

IF b4 > \$1B THEN MIX_IT

GOTO MORE_STUFF

NOISE:

DEBUG BELL

DEBUG ISHEX2 b4, TAB

DEBUG ISHEX2 b7, TAB, CR, CR

DEBUG ISHEX2 VALUE, TAB

DEBUG ISHEX2 b15, TAB

DEBUG ISHEX2 b14, TAB

DEBUG ISHEX2 b13, TAB, CR, CR

END: